

# Policy applications of research on the development and evaluation of air fares on the North Atlantic

by

A. KANAFANI

University of California, Berkeley

and

E. C. SPRY

International Air Transport Association

## INTRODUCTION

This paper is concerned with the experience in the application of research in policy making in international air transportation. The research deals with fares development and evolution, and the application was within the framework of the operation of the International Air Transport Association, in the setting of fares and the evaluation of fares packages.

In an effort to develop an improved capability for fares development and evaluation, the International Air Transport Association has undertaken a number of research activities. These research activities were specifically aimed at providing insights into the behavior of the air travel market in the North Atlantic, and at developing methodologies suitable for the analysis of this market.

The first effort was aimed at the development of a continuing traffic data acquisition and management system. This activity provided two important components of the data base necessary for a fares development system. One is the traffic and revenue by fare type statistics, normally supplied by carriers, and providing a continuing historic data base upon which to use analysis and projections. The other is an inflight survey from which demographic characteristics of North Atlantic travelers, as well as some indications of their travel habits and preferences, are obtained. Such information is quite helpful in developing traffic analysis procedures for use in fares evaluation.

The second effort was the development of demand analysis procedures, and the construction of traffic forecasting models. This effort provides the central methodological capability in the development of a methodology for fares evaluation. The resulting traffic analysis and forecasting models are used to characterize the response of traffic to changes in fare structure and in the socioeconomic environment. These models have been validated over the past three years and have evolved into a working tool for traffic analysis.

Third, an effort was undertaken to assess consumer behavior and preferences for the various attributes of the air transportation services available in the North Atlantic market. This effort was based on an extensive consumer survey conducted in North America and in Western Europe, and provided a data base intended for predicting market response to major changes in the characteristics of air transport service.

Finally, an effort was made to develop a capability for analyzing the impact of traffic behavior on the operating

costs of air transportation in the North Atlantic. It was recognized that cost analysis should provide one valuable input into the process of fares development and evaluation, if fares are to be cost based.

## PURPOSE

The research efforts described above provided a number of tools for performing the analyses needed for fares development and evaluation. These techniques have been adapted and validated to varying degrees. However, it became directly clear that in order to increase the usefulness of these techniques a framework was necessary within which to integrate them into a process aimed at fares development and evaluation and to show how each technique fits within this process. It is for this reason that this study was conducted with the following specific objectives:

- a. To investigate the feasibility of defining a meaningful framework for integrating the results of the earlier research efforts into a process of fares development and evaluation.
- b. If feasible, to develop the integration framework, define the process and the steps involved in it, and
- c. To define the role of each methodological activity and to describe it in an operational manner.

## RESULT

It was found in this study that integration of the previous research activities into a fares development and evaluation process is indeed possible and feasible. The conceptual and analytical frameworks for this process have been defined and the various analytical methodologies produced by the previous research have integrated into them. The full integration of the demand analysis and the traffic forecasting methods, as well as the data acquisition and management methods has been possible. Consumer research and cost analysis results, on the other hand, have been integrated in a more or less qualitative manner. For consumer research only a limited amount of results have been found compatible with the analytical procedures used in the rest of the process, but there is a potential value of the data base resulting from that research.

Cost analyses remain loosely defined, and while the conceptual framework for their integration has been defined, analytical integration could not be done to the same extent that the other analyses have been integrated. The reasons for this are discussed in greater detail in later sections of this report.

The major conclusion is that the research activities undertaken by the International Air Transport Association can contribute significantly to achieving a rational process for fares development and evaluation, and that such a process is now defined and can be implemented.

### CONCEPTUAL FRAMEWORK OF THE RESEARCH

Fares development is defined as a process through which a policy maker, at an industry or carrier level, designs fare packages for an air transportation market, in such a way as to optimize the operation of the system from the standpoint of some objective criterion. Fares evaluation is the complementary process by which a forecast is made of the operation of the air transportation system under a postulated fares structure, in order to generate policy variables useful in evaluating fares development policy. More specifically, a fares system is proposed for evaluation for possible implementation during a one- to two-year period in a particular market. This requires a series of analyses that would permit a forecast of traffic and revenues for the same period, assuming the proposed fares system is implemented. Together with a forecast of capacity and operating costs, this would permit the assessment of the economic feasi-

bility of the proposed fares system (traffic, revenues, profits, etc.) and the technical feasibility (load factors, etc.) of the proposed fares system.

The conceptual framework of this process centers around the idea that fares development and evaluation are policy matters and that the analytical inputs provided by the traffic analysis methodology represent only one input into a policymaking process that must take many other factors into consideration. The process defined in this study deals only with these analytical inputs to the process, but that should by no means be taken to imply that they alone can provide the answers as to what is an optimal policy for the air transport system.

Figure 1 is used to show the major aspects of the process conceptual framework and its iterative feedback nature. This diagram shows how policy represents the central focus of the process. Policy is influenced by the socioeconomic environment, and by the results of the fares evaluation process. On the other hand, policy guides fares development which in turn affects the traffic environment and the economic environment of the air transport system. Analysis is shown to combine the characteristics of the socio-economic environment and of the air transport service in order to produce the traffic and revenue forecasts needed for fares evaluation.

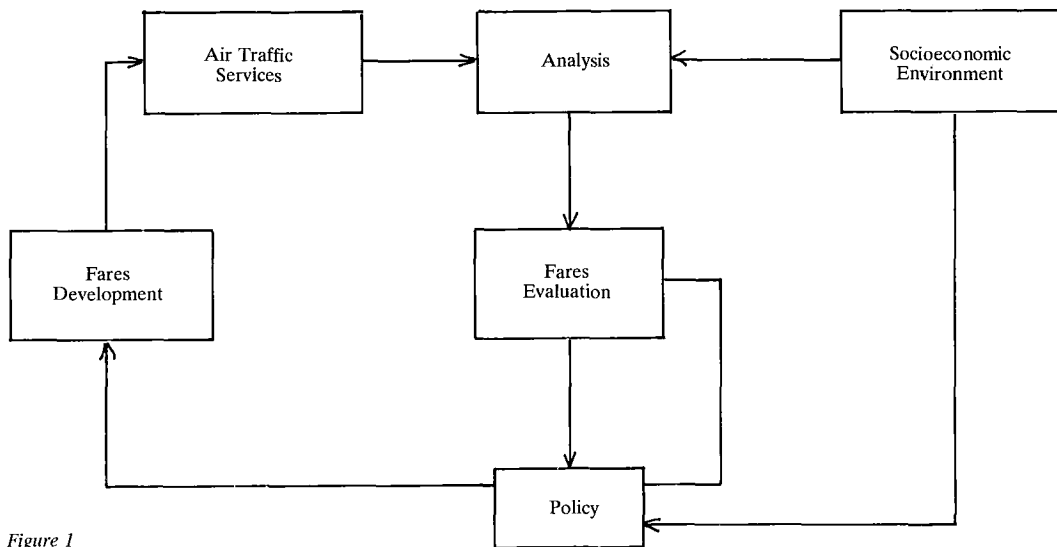


Figure 1

Fares evaluation depends of course on policy, which defines the objectives, and optimization criteria to be used in it whether they be traffic volumes, load factors, revenues, or profits.

With this conceptual framework, it is possible to integrate the various analysis procedures into the process as tools for policymaking. This integration results in the analytical framework discussed next.

### ANALYTICAL FRAMEWORK

The integration of the various analytical procedures into the fares development and evaluation process consists of pulling together five major analytical activities aimed at providing the necessary traffic and revenue forecasting capability needed for fares evaluation, and the consumer behavior and socioeconomic information needed for fares development. The five activities are mentioned briefly in this section and then described in detail in following sections.

**1. Traffic and socioeconomic data base:** This is an activity that deals with the management of a data system to provide information necessary for undertaking the other analytical activities in the process, as well as for influencing policy. It is a continuing activity whereby the data base is updated periodically as more data become available.

**2. Consumer research:** Using consumer survey data, this activity deals with characterizing consumer travel habits and preferences in an analytical way. It provides inputs to two activities. First, consumer research results may be integrated into the demand analysis methods to increase their scope. Second, these results can be used, albeit in a qualitative manner, to make fares development more responsive to, and compatible with, consumer behavior.

**3. Demand analysis:** This is the central activity which provides the traffic models necessary to forecast traffic and revenues for any given fares system and socioeco-

conomic environment. Demand analysis is based mainly on historical data and on statistical calibration methods. Therefore, it requires the integration of consumer research results into the traffic models in order to permit them to forecast phenomena on which no historic data exist, such as the market response to novel transport service characteristics.

**4. Socioeconomic forecasts:** Forecasting the socioeconomic environment for the fares evaluation period is an essential activity. It permits the forecasting of total traffic demand, the forecasting of costs, and it guides policy makers in the process of fares development. For some indicators, such as the macroeconomic indicators, it may be possible to obtain forecasts exogenously made, while for others, such as traffic demand or costs, it is necessary to have a forecasting methodology specific to the process of fares development and evaluation.

**5. Costs analysis and forecasting:** This activity provides the cost allocation and forecasting inputs to fares development evaluation, especially in situations where revenue and profit characteristics are important criteria of system performance. Costs forecasts are shown to be influenced by policy. This is because they are strongly affected by the capacity forecast, which is an airline policy matter.

These five activities are integrated in order to provide the necessary inputs to the fares development and evaluation process. Traffic and revenue forecasts are the major analytical input to fares evaluation. They are obtained by combining socioeconomic forecasts with projected fares systems as generated by the fares development activity, and using the traffic models resulting from the demand analysis and consumer research activities. Costs forecasts permit the comparison of revenues and costs in the fares evaluation process.

#### PROCESS APPLICATION

The process defined here is based on a general framework that is applicable to any air transportation market. As such, the process can be applied in the North Atlantic at an industry level as well as to any segment of the market that is served by one or more air carriers. It can as well be applied to different markets, provided an appropriate data base exists.

The analytical procedures integrated into the fares development and evaluation process have all been constructed and calibrated on the basis of North Atlantic data. However, the procedures themselves are applicable elsewhere. Application of the process to markets other than the North Atlantic would require the construction of a data base similar to that development in this study. This would include traffic and revenue statistics by fare type and season, plus trip purpose information of the type obtained in the North Atlantic Inflight Survey. The demand analysis process can then be applied and models appropriate to the market in question can be constructed. It should be possible to carry out the rest of the process by applying the traffic models without a need for as extensive a consumer research survey as the one conducted for the North Atlantic market. It should be emphasized, however, that the North Atlantic traffic models currently present in the computer system cannot be applied directly to other markets.

The process is also applicable to a segment of a large market such as the North Atlantic. The extent to which such an application is suitable on a one-carrier basis will depend on the extent to which such carrier's operations and market are typical of the segment it serves. For the North Atlantic, origin-destination segments are served by more than one carrier, usually by two. The application of the process to one of the carriers alone would require further data reduction, but more importantly may re-

quire the addition of market share consideration not currently present in the methodologies integrated into the process. This is particularly crucial in markets where high load factors exist during certain periods of the year, when capacity availability becomes an important supply variable affecting the amount of traffic by any one carrier. Therefore, care should be exercised when applying the process on a one-carrier basis.

The International Air Transport Association has validated the choice models for applications to individual carriers in selected segments in the North Atlantic, and given the positive results of this validation, it can be concluded that carrier application of the process is quite feasible. In fact, such an application would have the advantage that cost and demand functions can be assumed more homogeneous, thus permitting a more thorough integration of the cost and demand analysis than is possible at the industry level.

#### PROCESS LIMITATIONS

The fares development and assessment process defined in this study is based on the integration of a number of analysis techniques into a framework to provide aids in policymaking. The process as defined recognizes the importance of policy inputs other than those generated by the analysis models. Traffic demand forecasting models provide only one input into the process and do not as such provide the answers to all the questions that need to be considered in fares development and evaluation. This is an important limitation of the process, but is one that is inherent to any analysis process dealing with policy matters.

Another strong limitation is the restriction on the applicability of the process that may be caused by lack of appropriate data. It is unlikely that a data base exists for any air travel market that is as extensive as that of the North Atlantic. Having based all the analysis on the North Atlantic studies, they lead to a built-in luxury in data requirements. In many situations the acquisition of appropriate data would be so in time consuming that by the time a data base is ready for analysis policy issues may have changed. By necessity, the application of the process to other markets than the North Atlantic would require making certain assumptions where data are missing. As long as these assumptions are clearly documented and understood, then this limitation is not a severe one.

#### RESEARCH AND MONITORING NEEDS

The fares development and evaluation process is a dynamic and continuing process. Traffic results in any one year are fed back into the data management system and become historic data in subsequent years. A mechanism is built in the process whereby the traffic analysis and forecasting models are recalibrated and updated as necessary. Therefore, in order to ensure that an updated set of models is always available for the user, the implementation of the process will require a continuous monitoring activity. This involves continuing research into the performance of models, updating the data bases, and conducting the demand analysis activities needed. Methods for checking model validity have been incorporated in the analytic procedure built into the process. The application of these methods, as well as the monitoring of the overall applicability of the process, should be continuing activities.

#### EXPERIENCE FROM APPLICATION OF FARES MODELS

Having developed and verified the fares models described earlier, the next step in our program, and the one

in which we are still actively involved, is to have these models accepted beyond the circle of researchers directly involved in their construction and to have them understood and used by airline industry policy makers. In this second part of the paper, we would like to outline some of the difficulties we have encountered in this respect and to review the experience that has been gained in overcoming them. Since the problems involved have generally been concerned more with matters of communication, acceptance and comprehension than with anything intrinsic to the structure of the models themselves, we believe this experience might also be of some general use and guidance to others similarly confronted with the task of straddling research and its policy application.

As was pointed out earlier, the models that have been developed are the product of the efforts of a research team of the University of California and a number of airline research specialists working together in the IATA Commercial Research Committee. The Commercial Research Committee is one of a number of specialist committees within IATA that operate under the direction of the IATA Traffic Conferences, the Traffic Conferences being the forum within which the airline industry negotiates a common fares policy.

It was in direct response to Resolutions passed by the Traffic Conference dealing with air fares on the North Atlantic that these models were first developed. In summary, the Resolutions called for four things. First, the establishment of a more factual industry data base against which fare proposals could be evaluated. Second, a program of industry research into the key factors that affect the way in which the travelling public responds to changes in fare levels and conditions. Third, the development of a means whereby this information could be easily and consistently applied in assessing the likely impact of alternative fare structures - the models which have been described here provide that means. And, finally, application of such models in an attempt to explore ways in which the economic viability of the present fares structure can be improved.

These are admirably rational objectives, and aim to provide the airline Traffic Conference negotiators with a management tool for assembling and applying data and research findings relevant to development of North Atlantic air fares in a quick and simple fashion, a tool which would introduce an agreed uniform technique for evaluating likely market reactions to changes in the level of fares and thereby facilitate and expedite tariff negotiations between the different airlines involved. With hindsight, however, one can now see certain difficulties hidden in those objectives that were not so apparent when the Resolutions were drafted and first adopted. As we have said, these difficulties relate more to the communication, acceptance and comprehension, terms which have been used earlier this afternoon, of the models by policy makers than to anything intrinsic to the nature of the models themselves. The organizers of this Conference have asked the question: "How can existing research be applied more effectively to policy and planning decisions?" We believe our experience in presenting this research to the airline executives responsible for negotiating the industry fares policy and persuading them to make use of the models derived from it may give some hints on the answer to that question.

In analyzing the difficulties of applying research to policy decision-making, it is necessary to distinguish between situations in which policies are made unilaterally or by some authority with the power to select and arbitrate between competing interests and those situations that involve a genuine dynamic balance of power between a variety of independent and equally sovereign interests. Such a distinction is important because re-

searchers often appear to implicitly assume that the optimal course of developments prescribed by their study findings can be unilaterally pursued by policy makers or some such all-powerful authority. While, of course, there are situations in which such an authority exists, in most instances this is not the case and, as a consequence, any research built upon such an assumption will quickly be found to be impractical in reality and hence meaningless as applied research in the true sense of the term. In the case of international transportation, such an assumption is clearly inappropriate. International transportation by definition spans more than one jurisdiction and hence involves the interest of more than one independent and sovereign policy maker. Any research related to international transport must take this fact into account if its findings are to be of practical use.

We have been made very aware of such problems by the fact that while the models described here this afternoon were funded on an industry basis and were developed and tested using aggregate industry data, to be truly useful they must be applied on an individual carrier basis. There are at present more than twenty scheduled airlines operating on the North Atlantic; these carriers differ greatly in their objectives and competitive strategies and with respect to the regulatory philosophies to which they are subject; it is unlikely that any single model could take all these factors into account. Agreement between these airlines must therefore as a consequence be a matter of negotiation and compromise. While application of the models on an aggregate basis could produce a theoretically optimal fares structure for the industry treated as a whole, this is of comparative use only. IATA, despite its "monster in the skies" image, is no super-power over the airlines and has no authority to order the pursuit of such an aggregate industry optimum. The only optimum possible is a pragmatic one attained through compromise and negotiation. An IATA fares agreement is optimal in that it reflects an equilibrium between the interests of the various carriers involved. To be of real use in such a situation, research must assist and facilitate that negotiation process - not try to replace it. It is to that end that these models are being found to have their greatest potential.

In application, these models are not used to specify an optimal fares structure for the industry, nor to prescribe any one line of pricing policy development. They are normative only in respect of the logic and methodology they suggest for evaluating the market impact of changes to the fares structure. While the models were initially run using aggregate industry data, this was for development purposes only and is now used mainly for illustration. The nature of each airline's clientele is different, and while the models provide a uniform approach and glossary for negotiations, the assumptions and data to which they are applied must, to be useful, be the prerogative of the airline negotiators themselves. Thus the models provide not only a means for examining the available data in a uniform way, but also offer a discipline for the negotiating process itself and thereby act as an aid to facilitate and expedite such discussions.

We would suggest, therefore, that a part of the answer to the question, "How can existing research be more effectively applied to policy and planning decisions?", lies as much in emphasizing the discipline that a research approach can bring to policy decisionmaking as in any normative guidelines for policy that may be deduced directly from the research findings themselves. Needless to say, this is not so easy in practice. We shall try to explain why.

In all applied research, there is a potential conflict between researcher and policy maker. The essence of policy decisionmaking in any context where there are a

large number of independent interests, such as the IATA Traffic Conferences, has to be negotiation and compromise. Negotiation implies a unique, intuitive, non-transferable skill on the part of the negotiator for verbal manoeuvre and a flexible and discriminate use of available information. Research models such as those described here and alike all, on the other hand, imply a disciplined, explicit, learnable procedure for applying all available information. Clearly, unless considerable efforts are made by the researcher to ensure that the decisionmaker appreciates how such models can assist him in negotiation, there is a risk that he will interpret the discipline they impose more as an inhibition or constraint to his activities than a help. Under such circumstances, there is little chance for research to have any significant impact on policy decisions. Our application of these fares models again provides an illustration of the kind of problem to which we are referring.

As we have stated earlier, the Traffic Conference negotiators foresaw the need to make greater use of research in determining industry policy on air fares and accordingly established Resolutions calling into effect and funding the research program which has resulted in the fares models being discussed here. It is interesting, however, to trace the cycle through which the reception given by the Traffic Conference negotiators to this work has passed. The program to date has been underway for a little over three years. During the first year to year-and-a-half, when the technical research and data difficulties still loomed dauntingly large, considerable encouragement was given by the Traffic Conference to those working on the research side to continue trying to find a solution. Slowly, however, as such technical difficulties have been overcome and the research models have begun to take on a more coherent form, concern has grown among fares policy makers about possible misinterpretation and misuse to which they may be put, particularly in the sense of there being used in some way to evaluate any policy agreed by the Conferences or to veto any agreement that might be made. A great deal of this concern arose out of a failure on the part of a number of the Traffic Conference negotiators to understand not only the mechanism of the models but also the manner and context in which they are intended to operate. This concern occurred despite the fact that considerable efforts were made during the course of the development of the models to ensure that regular briefings and documentation on the work were given to the Traffic Conferences. Until about a year ago, a number of policy makers were still thinking of the models as prescriptive and hence, therefore, as some external threat or limit on their negotiating freedom. It was as if the industry research team carrying out this work had in some way been transformed into a group of "Sorcerer's Apprentices" toying with a fearful black box. Only a few policy makers understood from the outset the potential usefulness of such a tool in preparing and evaluating alternative policies prior to a Conference and in developing negotiating strategies. It has taken almost a year to date of airline-by-airline education to bring everyone to the same level of awareness - a process which is still continuing. We are happy to be able to say that now almost all of the major airlines operating in the North Atlantic market are actively working with the models and adapting them to their own company needs. To achieve this state of affairs has, however, required what is virtually a sales program.

Returning again to the question, "How can existing research be applied more effectively to policy and planning decision?", we are obliged to say the obvious. The degree to which research influences policy depends on how well the intentions and results from that research are communicated to those responsible for making policy

decisions. This communication effort is imperative and should be planned into any program of applied research.

For some researchers the effort required to effectively disseminate information on their work in a readily comprehensible form seems, however, often to be sadly neglected. To us, this is a strange attitude. Transport research is an applied science. Anyone working in that area must surely then have a potential application in mind whenever they begin a given project? Or do they? "How much research is in fact undertaken without any serious intent that it should find application in policy?" Perhaps implicitly realizing the heavy burden involved in following through any research to a policy stage, many researchers would prefer simply to do what they enjoy doing and to stand back from the grind and sweat of seeking to have their findings implemented in policy. Certainly if the experience we have had in disseminating information on these fares models and encouraging their use in determining fares policy is a good example of the amount of work involved, then we must say we have a certain sympathy with such an attitude. Fortunately, this has not been our case. IATA has had considerable assistance from UCB in these efforts to inform our member airlines about the models and their use. If we may, we should like to briefly mention a few of the lessons we have learned in this respect and the kind of responses which we have met.

First, for such communication to be effective, it is necessary for the researcher to have an understanding of the mentality of the policy maker and of the external factors that will influence his attitude towards the research. For example, we came quickly to realize that those aspects of the fares models that are of most interest to a researcher are not necessarily those that have greatest appeal to policy makers. In presenting them or any findings drawn from them, it has been more important to explain the ease with which the models can be used rather than any advance in techniques which they incorporate. A banal point, we know, but one frequently ignored. The reason for this is easy to see. Airline policy makers, like many others, are confronted with a constant stream of information and documents. To catch and hold the attention of policy makers, research must have an obvious means of application to policy. In our efforts to ensure that the models are truly useful, we have, for example, devoted a great deal of time to the adaptation of the original prototype research models into more straightforward management decision tools. This has meant simplification of the computer programs used in the models so that they can be utilized by personnel unfamiliar with the original research efforts made in their development. It has also meant the preparation of considerable amounts of educational material and operating manuals as well as the delivery of a series of presentations and seminars on the subject.

While such efforts may be novel to many researchers, it has been our experience that the completion of a research study must be considered as the first only of a series of steps in the total progress from theory into practice. We would estimate that between one-third and one-half of the total man-time devoted to the development of these fares models has in fact been concerned with dissemination of information about them. Even now, we still see the need for a continuing effort in this area in order to ensure that in those instances where airlines have begun to try to seriously apply the results from this work, they are not obstructed by others who are still comparatively uninformed and consequently unenthusiastic about this models.

Another area in which we have also found considerable difficulties in application has been the lack of suitable data for use in the models. It was our intention in

developing the models to ensure that adequate statistical information was available for their operation and we have, wherever possible, given such information or given guidance as to where it may be obtained. Nevertheless, a number of airlines have experienced some difficulty in assembling the necessary data for their own market areas and, in order that their interest be maintained, we have had to give extensive individual assistance to them in building up the required information base. The problem of lack of data is again one frequently ignored by researchers and particularly those who choose to work on a purely theoretical plain. If research is to be applied, then it seems obvious that the necessary data for its application must exist as a prerequisite, or if not, steps must be taken to have it gathered subsequently. Knowing that the lack of data frequently prevents the application of research and that this is a situation which can only be fruitlessly repeated many times over unless some attempt is made to initiate the collection of the required information, IATA has also tried to make use of these models as a means of defining the nature of the new statistical collections which are needed. We have established industry data collections that provide a market segmentation that is appropriate for use in these models and have almost all North Atlantic airlines participa-

ting in that collection. We are thus ensuring that given the continued willingness of the carriers to try to make use of these models, they will not be prevented from doing so by any future lack of data. It is unlikely that such industry data collections would have been established without the stimulus of these models.

One final point we would like to make concerns the time period required for research to reach a point where it actually influences policy. The researcher is fortunate in that he can work in a relatively unconstrained way. Policy makers are hardly ever able to operate in this way and as a consequence the acceptance of research such as these fares models by an organization as politically complex as the Traffic Conferences must obviously be a long, slow process. We expect that a further three to four years' work is still necessary before the approach to air fares development described becomes normally accepted industry practice. The researcher must have sufficient perseverance and stamina to stay with his research for the necessary period. There is no short-cut. The only comfort that can be offered is that this same conservatism which is delaying the application of his own work will, if it is accepted into policy, eventually come to protect it from any new replacement research approach.